Fueling capture

Introduction

Fuelling Capture: Africa's Energy Frontiers

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Abstract

The introduction to this special issue begins by surveying the significance of what we call Africa's internal energy frontiers for understanding a global energy realignment marked by experiments in renewable technologies as well as revanchist investments in fossil fuels. It then discusses capture as a concept rooted in both Marxist informed accounts of global energy regimes as well as the political histories and practices of African populations. Finally, it discusses the articles as spanning three economies of capture along Africa's energy frontier: resurgent extractivism, post-carbon development and consumer renewables.

Keywords: Africa, capture, dependency, energy, extractivism, frontier, solar

We are at a moment of global energy transition.

As heatwaves, droughts, floods and other climate change catastrophes pile up (Slater 2019), the decarbonization of the global economy has become the century's signature political issue. In 2018, the UN's Intergovernmental Panel on Climate Change announced that the earth had twelve years to dramatically reduce carbon emissions and keep global temperature rises to a maximum of 1.5 degrees Celsius (J. Watts 2018). Doing so will require radical changes in land, housing, transport and food systems. Yet such change is obstructed by a global infrastructure for consuming and burning natural resources, aided by a surge of ecocidal right-wing authoritarianism, and abetted by a host of institutional investments in fossil fuels and other extractive industries, including many of our own universities. Indeed, despite encouraging market signals for renewable technologies and, more importantly, calls for and experiments in decarbonization, 2019 emitted record high levels of global CO2 (Carrington 2019).

Africa hosts these trends *in extremis*. In 2018, Cyclone Idai devastated swathes of Mozambique, Zimbabwe and Malawi, testifying to the fact that the African continent is ground zero for some of the worst effects of climate change (Russo et al. 2016).

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Across Africa, multinational companies extract oil, coal and methane to fuel global energy needs, betting that 'weak states' and authoritarian governance structures will continue to tolerate 'dirty' fuels phased out elsewhere. Despite bearing the brunt of its effects, and supplying much of the raw resources that have fuelled it, the continent has been responsible for relatively little energy demand or consumption.

Yet this is changing. The African continent is both a crucial planetary energy *source* and, increasingly, an energy *sink*. Africa is the site of major economic growth and increasing middle-class consumption. Vast agrarian hinterlands, para-industrial megacities, natural resources coupled with the growing demand for electricity and the promise of leapfrogging centralized grids built at an earlier, postcolonial moment make Africa today a particularly fertile space of experiments with alternative energy.

As Achille Mbembe (2016) asserts, in many respects Africa is the last frontier of capitalism in the twenty-first century. For corporations, investors and entrepreneurs, the convergence of resources, local energy sources and emerging energy demand holds out the promise of profit and accumulation. But Africa's energy transitions are also creating *internal frontiers*. The concept of an internal frontier has been an important one for Africanist anthropology. In the past the term has been used to refer to the edge zones of centralized authority where new sorts of sociopolitical arrangements and accumulations are ventured (Chalfin 2010, 2017; Nyerges 1992; Kopytoff 2006). Today, the emergence of new forms of energy supply and demand are raising similar possibilities.

For many external commentators, increasing Africa's domestic energy supply is seen as a commonsensical way to 'lock-in' economic growth while combating poverty and environmental degradation (Alves 2019). Across the continent, however, national commentators, populations and governments recognize that domestic energy sources have an additional, political valence. They raise the possibility of autonomy, of African energy not only exported but processed and distributed locally to power African bodies.

This special issue of the *Cambridge Journal of Anthropology* is situated at these frontiers of overlapping and competing interests for Africa's energy futures. Bringing traditions of regional scholarship and theory into dialogue with a burgeoning anthropology of energy, the articles in this special issue ask how cutting reliance on transnational energy chains and foreshortening connections between domestic energy production and consumption reconfigure histories and established dynamics of extraction, autonomy and dependence. What sort of social and political formations find purchase in the technical and material affordances of air, sunlight, gas or recycled waste? And what are the stakes for theorizing the politics of energy that does not take fossil fuels as its paradigmatic case but rather begins with a complex field of global energy realignment, comprising multiple sites and sources?

The contributions that follow all explore this question ethnographically, examining diverse contexts of alternative energy generation and consumption across the African continent. Taken together, these articles advance an 'anthropology of capture', a framing that connects energy to broader debates about distribution, obli-

gation and interdependence in Africa and beyond. In this introduction we briefly situate this discussion within anthropology, and expand upon the articles' collective contribution.

The notion of capture has historical and conceptual roots in the capitalist world-economy. Today the word describes the taking of people and resources into possession or control by force, the bringing of bodies permanently within a sphere of influence, and the attempt to accurately represent or record. All three meanings powerfully resonate with the depredations of the slave trade and the colonial appropriation of territory, the violent extraction of minerals and natural resources, the expansion of European political authority and the production of white knowledge about black people, populations and bodies. Indeed, in the English language the word capture (from the French, and its Latin root *captus*) gained common use in the mid sixteenth century, at a time when it had new utility (both as a verb and a noun) to describe the rationale and outcome of English commercial and political activity across the world. For contemporary political economists, the law or rule of capture encodes this unidirectional logic, with the capturing of a resource followed by claims to ownership, and the pressure to rapidly exploit (Daintith 2010; Zalik 2015).

We propose that an anthropology of capture in the twenty-first century needs to retain this legacy and layered meaning while we reflect on its current utility in accounting for a broader spectrum of political and economic activity around the world. Taking inspiration from Africanist ethnography and political theory, we suggest that capture might be thought of as a more contested process where an economy of interdependent flows is inflected, redistributed or otherwise rearranged. Capture, in this sense, is not (just) grounded in the original sins and axiomatics of capitalist growth (e.g. Bear et al. 2015). As the articles in this collection show, capture can take place across multiple vectors and involve meso- and micro-level redistributive practices where the differences between theft and gift, seizure and exchange, production and consumption can be ambiguous (De Boeck and Plissart 2004; Ferguson 2015; Guyer 2004; Roitman 2005). A crucial corollary is that capture is not simply the negation of a relationship, but a mode of 'engendering and sustaining forms of relationality' in its own right (Dua 2019: 498).

This relational approach resonates with another, more colloquial meaning of capture, connoting the mesmerising capacity to *attract* or *draw in*. To capture is also to captivate in the grip of new imaginative possibilities. Domestically consumed solar, wind or natural gas similarly capture attention with their promise of difference, of side-stepping the ills of mainstream energy chains. Capture, then, evokes both histories of extraction and the anticipatory future, a state of affairs that might be claimed, evaded or foreclosed. At a moment of global energy realignment, how are various state, market, donor and community actors entrenching or repositioning themselves in Africa? How are they seeking to capture the opportunities and threats of a global energy transition?

In attending to the frontiers of energy capture, we also draw upon ongoing interest in the anthropology of infrastructure. As one widely cited definition puts it, 'infrastructures are built networks that facilitate the flow of goods, people, or ideas',

thereby comprising their 'architecture for circulation' (Larkin 2013: 328). If only implicitly, such circulation is built on capture and its paradoxical generativity through constraint. Energy flow, for example, can only arrive to consumer from producer via infrastructural enclosure, whether via photosynthetic cells or heat engines. At the same time, the inevitability of leaks, seams, openings, entropy – or 'parasites' broadly construed (Serres 1982) – all create novel possibilities and lines of flight. Georges Bataille (1991) similarly observed that energy capture always generates some excess or surplus that may spin off into new directions. Thus, for example, Timothy Mitchell (2011) charts how the choke points in late nineteenth- and early twentieth-century coal distribution networks formed a crucible of European labour activism, giving workers leverage to press new kinds of social and political rights. We build on these insights to focus on new energy infrastructures in formation, training our lens on the initial moments/phases of structuration where new paths of extraction, circulation and consumption are charted, and how they disrupt or redistribute existing arrangements.

The articles here contribute to the study of infrastructure in another way, namely by attending to the poetic and symbolic – the captivating – dimensions of new energy frontiers. Even when they are not working, infrastructures can function as 'dream zones' (Cross 2014) that anticipate the future, the nation or modernity. This is especially so in African contexts, wherein colonial and postcolonial 'white elephant' projects have long drawn populations into scenes of subjectification. As we elaborate below, the power of energy captured in solar lamps, oil pipelines or electricity grids often lies in the broader forms of life they seem to 'promise' (Anand et al. 2018; see also Weszkalnys 2015) as much as in what they actually deliver. We feel it is to anthropology's enduring credit that it is willing to take such 'merely symbolic' power seriously, as a force in its own right.

By exploring the complex ecologies and infrastructures of capture, then, all the contributions to this special issue seek to move beyond reductive narratives, caricatures and binaries of energy in Africa (e.g. utopian renewables vs dystopian carbon; centralized vs decentralized grids; dependence vs autonomy). Taken together, they show how Africa's energy futures are 'up for grabs' by diverse political players, if within structural constraints. The ability to address these futures depends on the material affordances of fuels and resources, the complexities of political and regulatory environments, and the emergence of new forms of expertise and moral responsibility. These outcomes themselves are always generative: crystallizing new circuits, coalitions and constraints.

Regional vantage points can sometimes be overlooked in anthropologies of global connection. Yet energy demands attention to place, its geopolitics coalescing around differential distributions of geography and geology-specific resource endowments, from methane lakes to wind plains to oil fields. The articles in this collection invite readers to examine the dynamic of capture across three distinct energy frontiers in contemporary Africa. The first include those frontiers of *resurgent extractivism* that find African governments and their private sector partners building power plants that utilize coal, oil or methane, often in connection with

a more general investment in extractive infrastructure such as deepwater ports, mining, or oil and gas concessions. The second include those frontiers of *post-carbon development*, that find a diverse array of municipalities, ministries and international development donor agencies working to build large-scale renewable energy infrastructures capable of adding electricity from wind, solar or biogas electricity into centralized or local micro-grids. The third describe those frontiers created by *consumer renewables*, and refer to the markets flooded with small-scale commoditized technologies such as standalone solar photovoltaic panels, as well as household or even more individualized gadgets such as solar powered lamps and phone chargers.

Energy, capture, capitalism

Considered as a bodily process, capture refers to tthe metabolic channeling and consuming of available energy for work. The capture of energy, beginning with plants storing sunlight through photosynthesis, is the basis of our food and life webs. As anthropologist Gretchen Bakke (2019) has written, a living body's biophysical metabolism is the substrate that our more elaborate industrial energy systems extend and displace.

All biopolitical systems for fostering life – that is, all systems that stave off the vulnerability of people and populations to the violence and caprice of the natural world – have depended on a parallel process of capturing or securing fuel (Szeman 2014). This process – whether we are discussing firewood or electricity – often appears to happen 'backstage', creating a phenomenological barrier to any energopolitical analysis. To be the beneficiary of a modern energy regime, then, is to inhabit what Mike Anusas and Tim Ingold have called a 'make believe world', a world where 'things work without calling for productive effort on the part of their operators', a world where the operators' efforts 'are applied without bodily contact with materials at the point of application, and are perceived without sentient engagement in the act of perception' (2015: 348). At one end, the heat of laboured exertion; at the other, something cooled and self-contained.

Such descriptions of human experience alienated from the source of this experience deliberately invoke Marx's ([1867] 1990) account of the commodity: a thing that circulates entirely divorced from the conditions of its production. In a Marxist spirit of social and cultural critique, the revolutionary move is to trace the thing back to the 'hidden abode' of its origin, and consider what moral or political dynamics have animated this trajectory and its concealment.

Much contemporary scholarship on energy in anthropology begins with the recognition that, as Dipesh Chakrabarty observed, 'the mansion of modern freedoms stands on an ever-expanding base of fossil-fuel use' (2009: 208). In Marx's often cited formulation, 'natural elements' which 'cost nothing' are being added into the production process, amounting to 'free gifts' to capital (quoted in Bakke 2019: 47). Yet, as ecological Marxists (e.g. Foster 1999) remind us, Marx's writings also provide tools for moving beyond a celebration of nature's free gifts and closer to a theorization of theft: a process of taking *without* giving, or capture.

In the sixteenth century, European capitalism depended on nature as a kind of externality or unpaid work that subsidised the production of value (Moore 2016). Forests were vital for construction, timber and firewood for forges. But 'cheap nature' as much as 'cheap energy' was not 'out there' in any naïve positivistic sense. Instead, forests had to be marked out, appropriated and alienated. Doing so successfully – as in, for example, the European clearance of people and trees from what were once thought to be the apparently sparsely populated and limitless forests of North America (e.g. Proulx 2016) – required not only violence but social relationships, imaginaries and techniques. The genocidal and ecocidal effects of settler colonialism on indigenous peoples and ecosystems in North America prefigured what, today, some call the 'Anthropocene' (Whyte 2018).

In the eighteenth century, the search for cheap nature and energy found its apotheosis in Caribbean sugar plantations, where African slaves were literally worked to death in the fields. Caribbean slavery formed a crucible of capitalism and accounted for much of its excessive wealth creation (Mintz 1985). Plantation slaves, as David McDermott Hughes (2017: 29) argues, were also 'the first fuel'.

In the 1700s, Spanish Trinidad had sunshine, fertile soil, wealthy settlers, equipment for sugar mills and slave labour. But plantation owners needed more manpower. Cane cutters working with members of the local political administration turned to the transatlantic slave trade for the supply of more bodies. As they calculated their requirements, they introduced what Hughes calls a 'scientific mode of measurement' to establish how many slaves were required to meet projected outputs of sugar in the plantation economy. In doing so, they began to imagine energy for the first time as a commodity. Their models treated all slaves as identical, construing them not just as abstract units of labour but as energetic objects or fuel.

> If every slave worked at the same rate every day, then the master could reliably stock his fields with three slaves per field. Laborers could function like barrels of sugar or, better yet, as wood used to heat cane juice to a boil: they would serve as the faceless fuel of the plantation machine. (Hughes 2017: 39)

As Hughes writes, Trinidad's plantation managers and administrators thought much like oil companies might today. Slave bodies stored energy in a measurable, countable, transportable and saleable form, with a value that can be exchanged for things of equivalent or comparable value. Slave fuel was a substance to be obtained and consumed and, as it was used up, they hunted for new supplies rather than restrain consumption.

The energetic history of slavery reminds us that capture is deeply 'necropolitical'. This is Achille Mbembe's term for the sovereign right to *extinguish* (Mbembe and Meintjes 2003), of which death is the ultimate expression (see also Doughty 2019). The transatlantic slave trade represents the paradigmatic necropolitical form of energy capture (Lennon 2017). The slave trade involved the ripping out of human bodies from their positions within intersubjective social networks and lifeworlds and their re-rendering as purely physical bodies for work until death. Slavery was

an essential part of the gift of cheap nature that capitalism arrogated to itself, subsidizing the ability to grow and reinvest at ferocious rates at the former's expense and despoliation.

The Caribbean was the site of the world's first continually productive oil well in 1866, and by the end of the nineteenth century the full ensemble of social relationships, imaginaries and techniques that constituted capture in the oil industry were beginning to be codified in law.

In 1889, as Matthew Huber (2015: 36) has written, the future of oil exploration in the United States was shaped by a legal decision that formulated 'the rule of capture':

> In order for oil to be produced as a commodity, the first question is how to delimit property rights over a resource that is not only subterranean but also liquid and mobile. On the one hand, no oil producer or landowner could ever be sure how much oil existed underneath the surface of a particular property, and, on the other hand, that very oil had the unruly capacity to migrate across property lines. This conundrum was solved by a legal decision by the Pennsylvania Supreme Court in 1889 named 'the rule of capture' (Zimmerman 1957, 91–100). The court likened petroleum to a 'fugitive' substance that, like 'wild game', moves below the surface of the earth, and declared that 'if an adjoining, or even a distant, owner drills his own land, and taps your gas, so that it comes into his well and under his control, it is no longer yours, but his'.

In this legal decision, the definition of capture presumes a lack of relation. Subterranean flows of oil are imagined like a wild animal or fugitive, entities that, because they are (legally) alienable from an existing social or ecological order, may be freely appropriated.

Anthropologists are gradually becoming accustomed to think more closely about the ways that fossil fuels have underpinned modern projects to render or discipline nature and populations. In this sense, we might say, capture is quintessentially 'energopolitical' (Boyer 2014). But in each of the contexts described in this collection, energopolitical projects have unfolded unevenly. Frontiers of mineral extraction, infrastructure development and market expansion find pockets of state order and legibility in a heterogenous and variegated landscape. In these contexts, the relationship between energy and politics is also under-determined.

Africa's history puts it at the very centre of debates about energopolitics. But what would an energopolitics look like *from* Africa?

Capture from the south?

Even after the abolition of slavery, Africa remained a site of relatively raw resource extraction and, as so many dependency theorists have argued, 'underdeveloped' (Rodney [1972] 2018). By the mid twentieth century, however, a wave of global decolonization marked the possibility of a political independence that might 'cut the straws' of colonial extraction and rule that had been inserted into the African

body politic (see Brennan 2006). In many African countries, the decades after independence saw the construction of massive hydropower dams and centralized grids for the transmission of electricity that were meant to power this autonomy and self-sufficiency, resonant with industrializing strategies like import-substitution and ideological postures such as socialist 'self-reliance' (see Lal 2012). These statist energy megaprojects were often premised on a massive amount of internal capture in the form of environmental destruction and local dispossession, albeit in a way that could be symbolically recuperated as national sacrifice (Isaacman 2005; Miescher 2014; Tischler 2014; Yarrow 2017). Indeed, in return for displacements, new national populations would receive modern energy inputs that would allow them to kickstart a virtuous circle of development while touting transparency and local employment (Appel 2012; Oppong 2018).

Fifty years on, these aspirations remain largely unfulfilled. Instead, a different kind of economy, at once quite new and quite old, has taken its place. It is an economy of high GDP growth fed by a primary commodity and hydrocarbon boom that has stoked mining and exploration across almost every corner of the continent and its offshore domains (Chalfin 2015; Leonard 2016). This neo-extractive economy is wildly concentrated and monopolized by an oligarchy of foreign corporations and state elites. As James Ferguson (2006: 39, 207) has pointed out, the logic of privately governed contemporary oil concessions is not much different to the Belgian Free State's in its division of 'usable' and 'unusable' Africa.

At the same time, the sheer scale of global demand for oil, natural gas, minerals, food and arable land has brought some measure of development as companies invest in infrastructures such as roads, ports and electrical supply, a trend that is popularly glossed as 'Africa Rising' (Taylor 2016). Relatedly, Africans living on low incomes are themselves increasingly imagined as viable consumers for goods and services. A number of companies have made enormous profits selling sophisticated technology to African consumers, particularly in the telecommunications and mobile banking sectors (Donovan and Park 2019), but also by importing a mind-boggling array of cheap commodities, from motorcycles to textiles, televisions to farming equipment, mostly from China (Fioratta 2019).

It is at this conjuncture that energy independence becomes a critical issue. On one hand, Africa's vast endowments of wind, solar and geothermal energy promise to solve a number of problems at once. First, they appear to be sufficient to meet the growing energy demand of African consumers and power economic growth into the twenty-first century. Second, these energy endowments appear capable of reversing a centuries-long process in which Africa has been a source of fuel sent elsewhere. Third, because these resources are renewable, they are imagined as solutions to future environmental catastrophe.

Yet, on the other hand, this apparent 'win-win' hides deeper tensions, histories and trade-offs. The cheapest and most accessible renewable energy technologies available to poor consumers, for example, are piecemeal and stopgap, dependent on cheap, proprietary, carbon-heavy technology produced elsewhere – seeming to affirm rather than transform the marginal status of poor consumers. Meanwhile,

projects that try to scale supply and sustainability by weaving things like wind and waste power into existing grid distribution systems require a complicated mixture of technical ingenuity, innovative financing drawn from the world of aid donors and development initiatives, and agreements with local authorities. They may be more or less successful or more or less profitable, but never the promised silver bullet of green capitalism. Finally, at the far end of the spectrum, state governments and private investors are collaborating on massive investments and infrastructure projects that scale around fossil fuel extraction. These frequently appear to resuscitate older imaginaries of centralized provision, as well as older histories of internal environmental and social dispossession.

What is common to all of this is a background in which Africa, despite its growth, has remained and, to some extent, still remains in a vulnerable position in relation to both the West, China, and the political and economic forces concentrated within them. How can we comprehend this political economy without falling back onto a determining logic or language of neocolonial 'capture'? How can we grasp the ambiguities in which extractive dynamics become folded into internal energy frontiers?

One way of addressing these questions is to draw from political theorists of the state in Africa who have used capture in a different but inflected sense. In his massive survey of the state in Africa, Jean Francois Bayart (1993) qualified theories of 'dependency' by exploring the various ways in which postcolonial African populations, classes and factions were active players in the integration of the continent into the capitalist world system. This collaboration was manifestly unequal, often entailing supervising the extraction of resources by foreign powers. But political elites also set terms and collected rents on this outward flow and then reinjected them back through local institutions and sociopolitical networks, giving rise to a complex topology of circulation that confounds what is 'inside' or 'outside' Africa. Moreover, subordinate populations were themselves active participants in the making and unmaking of this global dependency. They could remain maddeningly 'uncaptured' (Hydén 1985) by the projects of colonial or postcolonial discipline, but also capable in their own right of what Mike McGovern (2010: 56–57) calls 'entrepreneurial capture' – the ability to seize, block or otherwise 'take a cut' of the circulation of people and things. Crucial to this latter process was the willingness of actors to advantageously position themselves by taking up new opportunities with alacrity – from religious conversion, trade specialization and migrant wage labour to new technologies, identities and, yes, we suggest, energy sources. This creativity and hustle of African life, well documented in recent scholarship (e.g. Simone 2004), speaks to a fundamentally 'distributive politics', a process of 'diversion, division and tapping into flows' (Ferguson 2015: 96).

Crucially, Bayart turned to a popular African energo-metabolic idiom to describe this economy as a 'politics of the belly'. To 'eat' is to plug in to a larger distributive network, albeit one with an often pronounced hierarchical structure. This is a rendering of politics and ontology in which you are always fed by others (or feed upon those others); in turn you feed others (or are yourself fed upon). In

this sense, capturing an 'energy feed' is always partial and situated, a practice by which larger ecologies of interdependence are forged and given shape. It is in this relational sense that Jatin Dua uses the term in his study of care and capture among seafarers off the coast of Somalia and Kenya. Offshore, Dua argues, the 'ultimate form of captivity is to be abandoned' on the ocean, 'to be set free' (2019: 2).

Mindful that it is near impossible to delink entirely from global/transnational/translocal energy interdependencies, our ethnographic analyses refocus on collaborations and collusions, on the intimate melding and masking of political projects with the technological challenges and moral goods of internal energy sourcing. We examine these collusions and collaborations along three kinds of energy frontiers: resurgent extractivism, post-carbon development and consumer renewables.

Resurgent extractivism

The mid 2000s inaugurated what in many respects was the infrastructure decade, when massive investments refurbished downtown business districts in a bid to see Africa Rising. By the late 2000s, many African governments like those in Rwanda and Uganda were embracing a Beijing Consensus that development might be achieved through a centralized authoritarian capitalism that courted foreign investment and crushed internal political dissent. Domestic energy supply quickly became woven into these plans. After the deadlock of World Bank and IMF imposed structural adjustment and the misguided attempts to unbundle electricity monopolies in the 1990s, emphasis shifted to increasing supply, often with reference to increasingly unstable hydropower that made up the base of most fuel mixes. At the same moment that decarbonization began to enter the global economic discourse, oil and gas discovery set off a round of new speculation and investment in Ghana, Tanzania, Mozambique, Kenya and Uganda. This resurgent extractivism shows no sign of abating, although as we note below, Chinese companies have recently turned to the sale and manufacture of renewables for the continent.

What is of particular interest to us is the kind of bargain that is struck here, one in which national development comes at the price of democratic expression and, at the far horizon, ecological sustainability. Kristen Doughty tackles this most directly in her article on a new methane extraction and electricity generation operation that has set up around Lake Kivu, Rwanda. This is a multivalent process, warding off potentially explosive gas accumulation and promising a new future in ways that mirror Rwanda's ongoing processes of 'repair', a phrase usually savoured by STS-inclined anthropologists but that Doughty rightly warns we might receive a bit more ominously, marked as it is by the militarized 'protection' of sensitive zones at the lake. In the massive spiralling lights of the new downtown Kigali Convention Centre, coloured in the green, yellow and blue of the national flag and powered by methane, Doughty shows us how resurgent extractivism can speak, however hollowly, in the language of unity, national development and even pride. Even if ordinary Rwandans do not experience the benefits of all this new power generation, they might experience the *image* of that benefit. One is reminded of Filip

De Boeck's description of his own interlocutors in Kinshasa reflecting on a luxury enclave development soon to dispossess them: 'yes we'll be the victims, but it will still be beautiful' (2011: 278).

However compelling their poetics, such dispossessions can also coincide with a sense that ordinary people are not getting their cut of the cake. In 2013, for example, citizens of Tanzania's historically underdeveloped southern region of Mtwara rioted (and were soon violently suppressed) after the government announced that a 330-mile-long pipeline would be constructed to transport liquified natural gas up to a processing plant in Dar es Salaam for export and generation for the national grid (Lal 2013). Such dispossessions can also lead to a more surreptitious distributive politics in which people simply 'help themselves', recapturing some of what has been taken from them. In his ethnographic analysis of artisanal refineries in the Niger Delta, Omolade Adunbi shows how long-running techniques of 'tapping' in the Niger Delta become a way to redistribute the flows of oil consumption and production through local communities and thus contest who has the right to the profitable abundance of fossil fuel energy. These cases highlight the way in which the 'subterranean' materiality of fossil fuel affords certain political claims: our ancestral land, our oil (cf. Rogers 2015). However much one might want to, it would be foolish to dismiss extractivism or render it politically inadmissible on the basis of its ecological devastation. In Africa and beyond, it is a live and active force whose appeal to variants of both socialism and barbarism must be understood and taken seriously.

Post-carbon development

If the discovery of new oil and gas resources on the continent has created one kind of scramble, then its possession of renewable resources has created another. And if oil and gas have elective affinities with neoconservative or authoritarian politics (but also their rebellious inversions), then in many ways renewable energy sits closer to the neoliberal (pseudo) centrism of the Washington Consensus. Unlike oil, gas or coal, no one 'owns' wind, light or biochemical reactions as they move through the world, and the technical ingenuity involved in capturing their powers resonates with a fantasy of clean development and 'sustainable' growth without consequences. But because no one owns them, they are also commons not yet enclosed, and hence provide an enormous opportunity for primitive accumulation and profit. This mix of the ethical and the enterprising leads to a crossbred (and sometimes inbred) 'postpolitical' world of NGOs, businesses and donors that has variously been described as neoliberal governmentality, entrepreneurial citizenship and so forth (Irani 2019). With respect to energy in particular, and with a nod to the postcolonial, we might call this post-carbon development – that is, a development that, despite its gestures to the new, has inherited a deep, carbon-based structure that it must reckon with, however unevenly.

A number of energy scholars have been exploring this space in Euro-American contexts. Myles Lennon charts how US 'antiracist activists endow solar panels with

the capacity to upend the fossil fueled order that de-matters black lives', even as (more on this below) their materials are voraciously mined in the global south, destined for the mounting global pile of toxic e-waste, and in the case of at least one large manufacturer, assembled with prison labour (2017: 23). In Laura Watts's (2018) richly poetic telling, the Orkney Islands situated off the north coast of Scotland are a living laboratory for post-carbon development. Decentralized wind turbines capture the North Sea's squalls and gales, producing more renewable energy than the islands can use or export, and catalysing all manner of experimentation in ancillary storage via electric vehicles, 'grid batteries' and hydrogen fuel cells. Energy startups flock to Orkney, testing waterborne technologies like megalithic spinning blades and building-sized 'oyster shells' that swing open with the ocean's churn. And yet most islanders remain in fuel poverty, paying through the nose for electricity that the mainland ships back through a single narrow cable at an exorbitant exchange rate. Wave power is, at least at the moment, trending towards maritime enclosure, with the largely unaccountable Crown Estate leasing out Orkney's ocean blocks and farmland, displacing fishermen and crofters.

We can see similar ambiguities at play with the contributions by Brenda Chalfin, Erin Dean and Kristin Phillips. Like Watts and Lennon, they refuse easy answers and attempt to stay with the trouble, tracing the redistributions of matter and energy along these frontiers of energy capture. The stakes are perhaps clearest for Phillips, who takes us to the zero-level of what it might mean to capture an energy source. For the communities of rural Singida she works with, connection to the national grid might mean freedom from the 'unpredictable grace of the sun', from the thin margins of bodily energy storage and expenditure it affords. Here the ability to inhabit a make-believe, energy-intensive world seems quite far away, and what instead remains is the effortful calculus of work for sustenance, where metabolic change is tracked and figured through forms of heliocentric ritual and cosmology. Likewise, Dean shows how, for the island of Zanzibar, solar generation raises the possibility of cutting the 39-kilometre, 100 MW undersea cable that both literally and symbolically tethers its residents to the Tanzanian mainland.

And yet solar, wind or biogas generation are not free of political economy. It may be that poor or otherwise 'surplus' populations will not benefit from energy independence absent a whole series of other more extensive investments in local infrastructure and economies necessary for metabolizing it. It may be the case that the wind farms, biofuel plantations or hydroelectric dams needed to materialize these sources will entail forced dispossession and displacement. Or it may be that consumers find themselves in a new sort of precarious dependence, as energy supply expands or contracts with the unpredictable whims and movements of NGO projects, donor priorities or short-term business ventures.

Chalfin's case study of an 'excreta to energy' project by a Netherlands-based NGO, Shaarey, operating in urban Ghana, teases out these complex dynamics. Feeding waste into a massive bio-digester which then converts methane into electricity, we see what is perhaps the most extreme example of energy autonomy, a virtually closed loop of supply and consumption. And yet this loop is underwritten

by a different dynamic, what Chalfin terms a necropolitical capture of the state's statutory monopoly, in which residents provide Shaarey with a kind of cheap nature that ensures profit, not to mention vast tracts of urban real estate and preferential contracts with the power utility. Here biopolitical aspirations to autonomy and power in the form of electricity are premised on a kind of auto-extraction, 'an urban underclass reduced to faecal suppliers'.

Consumer renewables

Below the national or even regional-scale levels of mega hydro dams and coal plants, or beyond the meso-level of municipal- or district-level experiments in wind or solar generation, lies a micro level of low-grade solar powered technologies such as batteries, lamps and radios.[1] These little electric cilia are scaled in size and capacity to the individual body, and for many people arguably comprise the most direct experience of 'renewable energy'. There is a satisfying immediacy here; much as other affordable consumer technologies like mobile phones have transformed African lives (Archambault 2017), solar power can provide small satchels of light and communication. And yet these systems are also cheap and prone to breakdown, locking people in short-term cycles of expenditure and consumption. In his article on the marketing of solar power technologies in a Goudabou refugee camp in northern Burkina Faso, Jamie Cross shows how the cheapness of this solar commodity (cf. Fioratta 2019) finds an elective affinity with the humanitarian logics of 'crisis provisioning' (Redfield 2013) rather than long-term developmental horizons.

Elsewhere, Cross and Declan Murray (2018) explore the fact that such solar technologies are renewable only if one brackets their 'embodied energy' (Benjamin 2017) – the carbon emitted across the entire lifecycle of their production, transport and discard. Is it possible to break through the stultifying misrecognition of renewable *objects* to evaluate renewable *processes*? They suggest yes, describing an array of fantastic experiments in providing and promoting electronic repair and recycling, highlighting the way materials may continue on even after objects die. Such creative ingenuity has long been a part of African urban life, albeit one often experienced with a mixture of bemusement and resentment. As one interlocutor once asked Michael Degani, why does the rest of the world make things while Africans can only repair or modify what they've been given?

These concerns are addressed in Degani's article, which tracks the development not of a specific renewable energy source, but rather of a material that might come to be part of a broader decarbonized metabolism: cellular foam concrete, or aircrete. Though not completely renewable (it still requires cement), aircrete's lack of sand aggregate cuts out massive transport and construction costs and associated environmental harm. Degani follows James, an American ex-security contractor and mining engineer living in Tanzania, as he attempts to bring the technology to market and, failing that, to the more nebulous players in the post-carbon development space. Like many entrepreneurs looking to capture consumers at the bottom of the pyramid, James is less focused on the morality of renewables than their

utilitarian efficiencies – their aeolian 'lightness' compared to the resource-heavy expenses of extracting oil or rock out of the earth.

Resurgent extractivism, post-carbon development, consumer renewables: it is best to think of these frontiers as ideal-types that mix empirically. A company that sells household solar systems on instalment is clearly out to capture the potential of poor populations as a valuable consumer base, but in their aesthetics and ideology and sometimes capitalization structure they draw liberally from the institutions of post-carbon development (Rolffs et al. 2015). Similarly, securing contracts for large-scale wind farms or biofuel plantations may involve the rough politics of displacement and elite 'tenderpreneurship' that are not unfamiliar to oil concessions and the thermal generation plants they supply. Nevertheless, each of these concepts might be thought of as emergent frontiers in the development of Africa's energy futures, carrying their own particular sets of constraints and enabling possibilities.

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Notes

1. This is to some degree thanks to the economic vagaries of China, where renewable energy companies have glutted the market, prompting an expansion into Africa (Shen and Power 2017).

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